

## Supplementary Information

### **Enhancing pollutant removal efficiency through multi-flow cascade flocculation and flotation reactor: A detailed flow field analysis**

Qingji Wang<sup>a, b, f</sup>, Hao Wang<sup>a, b</sup>, Xiumei Sun<sup>a, b</sup>, Liang Li<sup>c, d, e</sup>, Xing Liang<sup>c, d, e\*</sup>

*<sup>a</sup>CNPC Research Institute of Safety and Environment Technology, Beijing 102206, China*

*<sup>b</sup>State Key Laboratory of Petroleum Pollution Control, Beijing 102206, China*

*<sup>c</sup>School of Chemical Engineering and Technology, China University of Mining and Technology,  
Xuzhou, Jiangsu 221116, China*

*<sup>d</sup>State Key Laboratory of Coking Coal Resources Green Exploitation, China University of Mining  
and Technology, Xuzhou, Jiangsu 221116, China*

*<sup>e</sup>National Engineering Research Center of Coal Preparation and Purification, China University of  
Mining and Technology, Xuzhou, Jiangsu 221116, China*

*<sup>f</sup>College of Chemical Engineering and Environment, China University of Petroleum-Beijing,  
Beijing 102249, China*

Corresponding author: Xing Liang

Tel.: 86+13201817769

E-mail: liangxing@cumt.edu.cn

Corresponding author at: School of Chemical Engineering and Technology, China University of Mining and Technology, No.1  
Daxue Road, South, Xuzhou, Jiangsu 221116, China. Tel.: 86+13201817769  
E-mail address: liangxing@cumt.edu.cn

**Table S1**

The concentration of inorganic salts in mineralized water.

Salts	NaCl	NaHCO <sub>3</sub>	Na <sub>2</sub> SO <sub>4</sub>	CaCl <sub>2</sub>	MgCl <sub>2</sub> ·6 H <sub>2</sub> O
Concentration (mg/L)	1167.2	2442.9	6.8	59.7	53.1

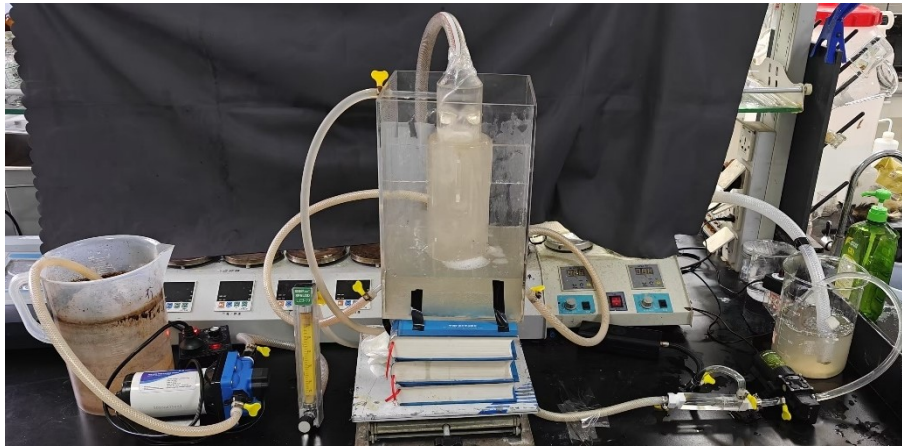


Fig. S1. The real flocculation-flotation process achieved by this reactor.

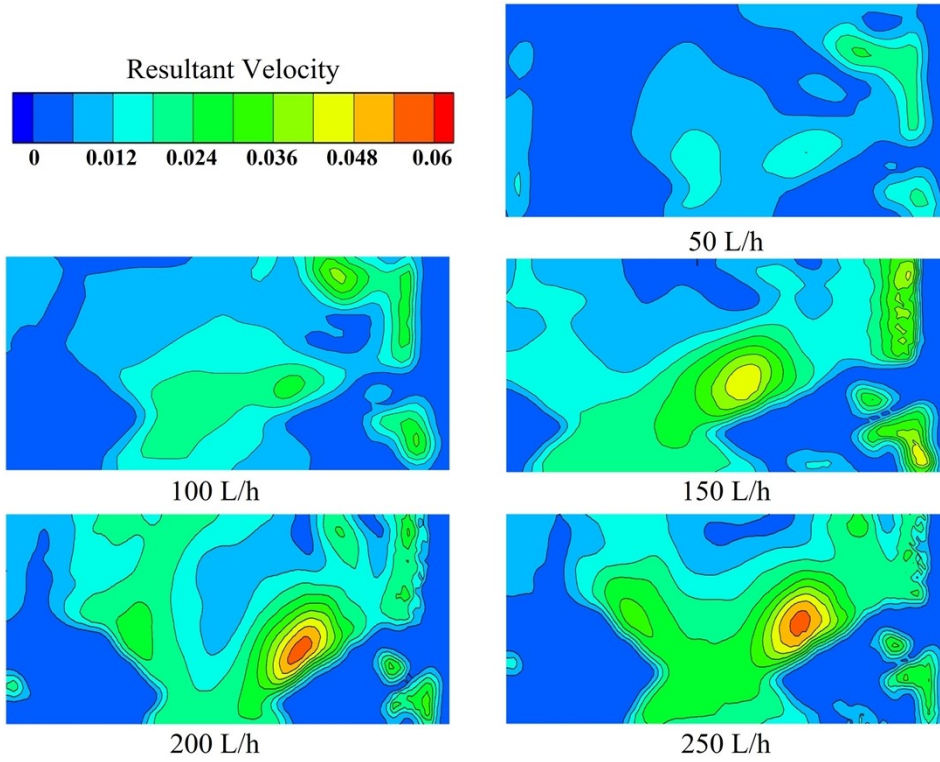


Fig. S2. PIV images at different flow rates at position near the inlet of wastewater.

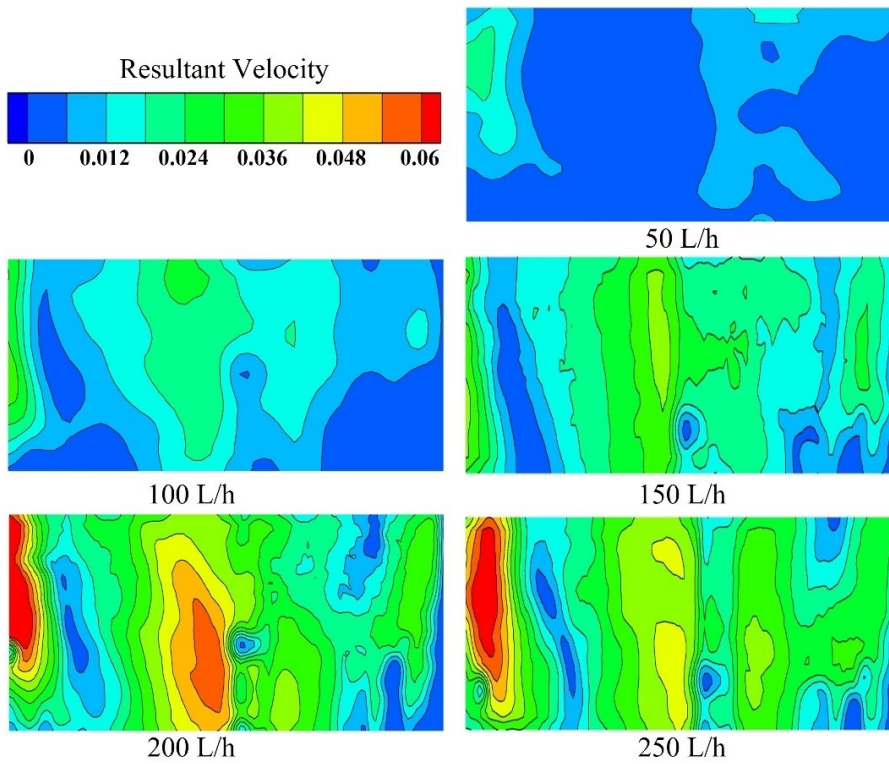


Fig. S3. PIV images at different flow rates at position A.

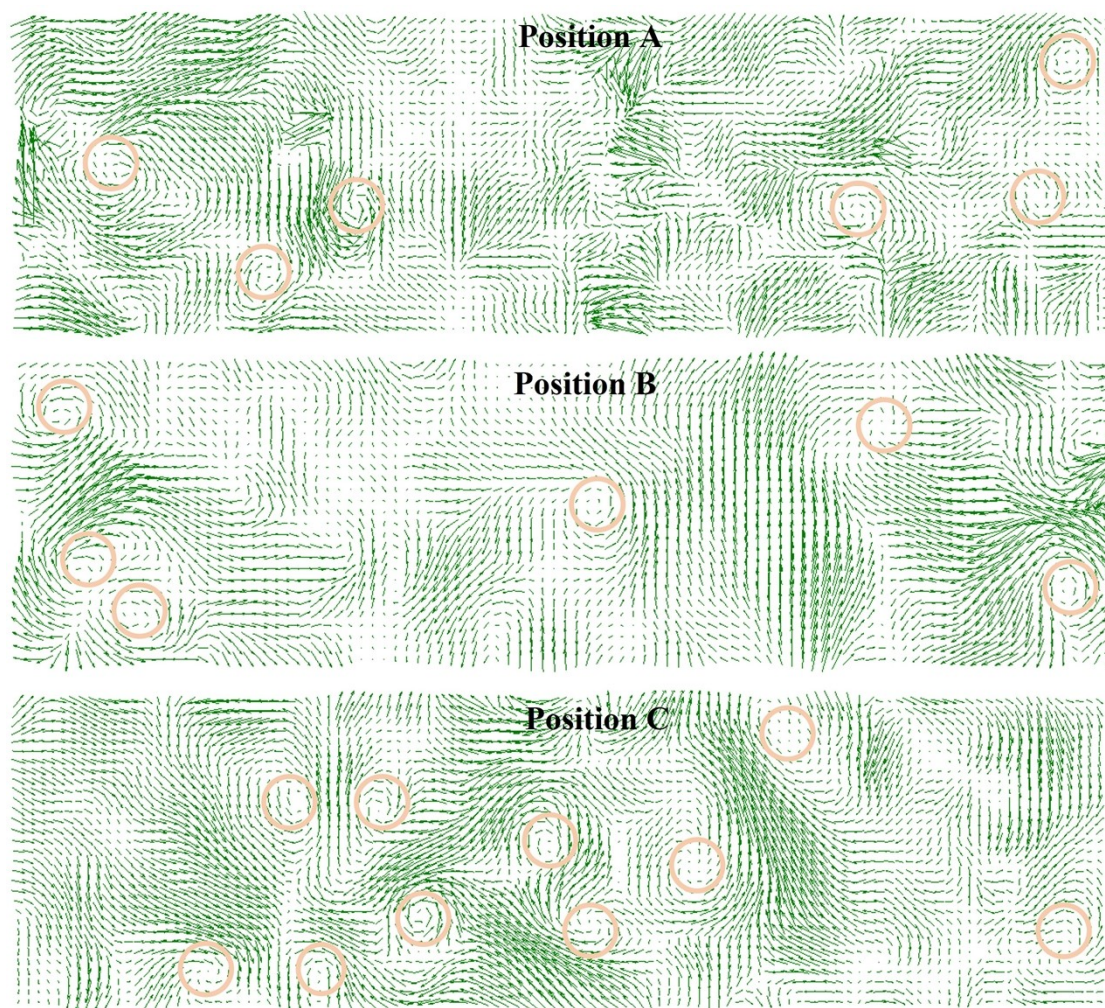


Fig. S4. PIV image of the vortex structure inside the reactor with an inlet flow rate of 150 L/h.

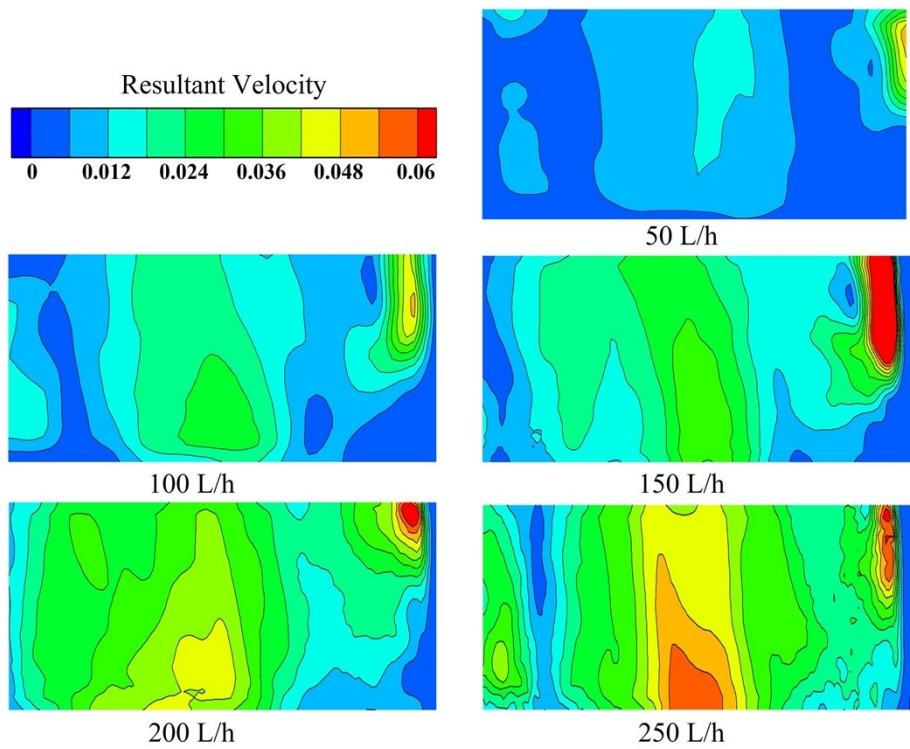


Fig. S5. PIV images at different flow rates at position B.

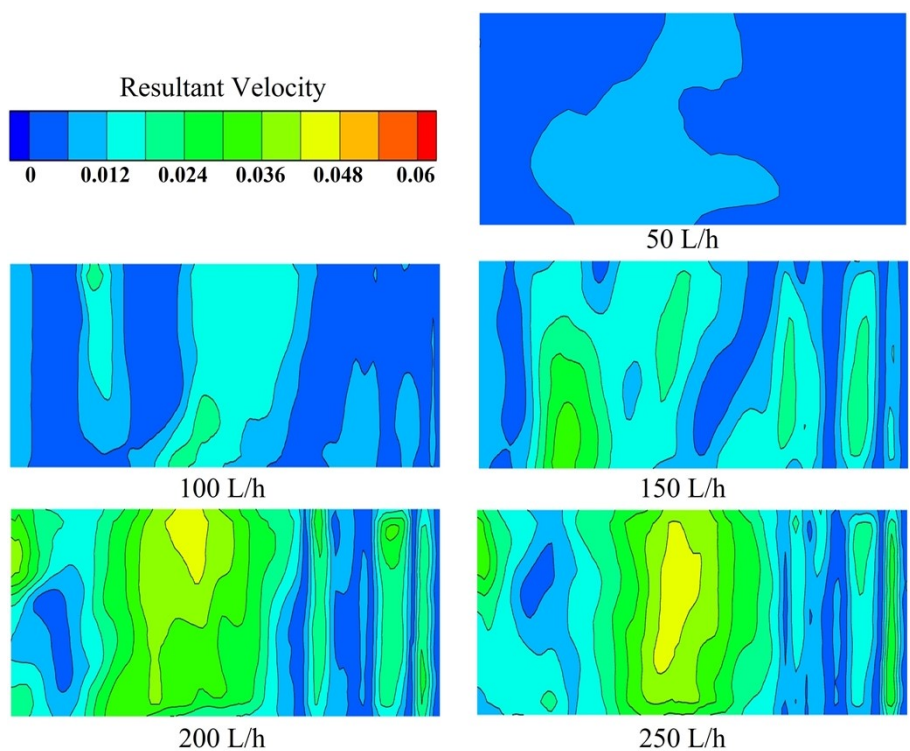


Fig. S6. PIV images at different flow rates at position C.

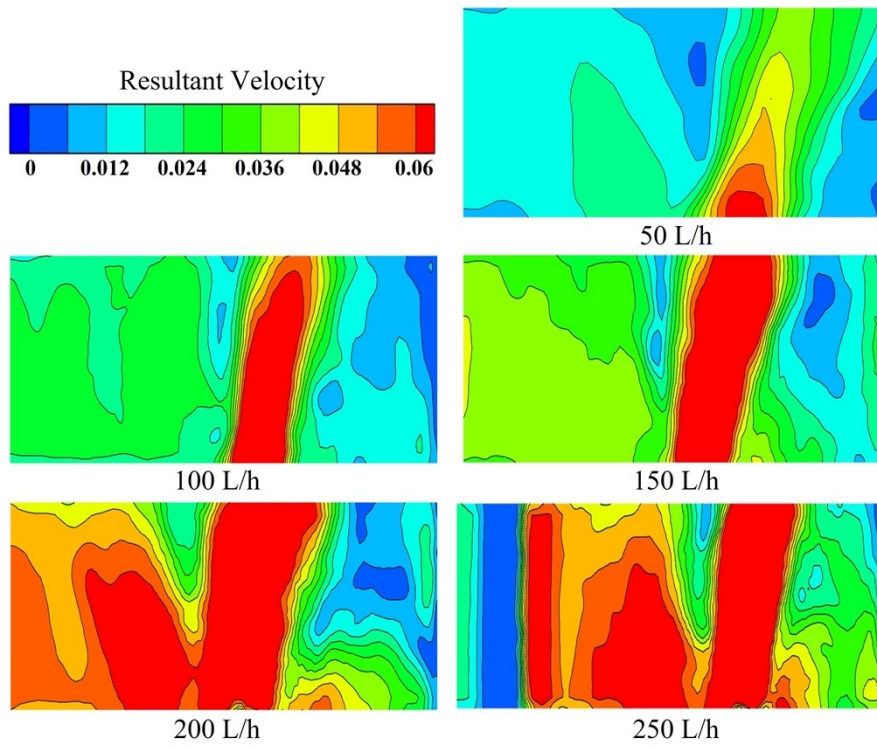


Fig. S7. PIV images at different flow rates at position D.

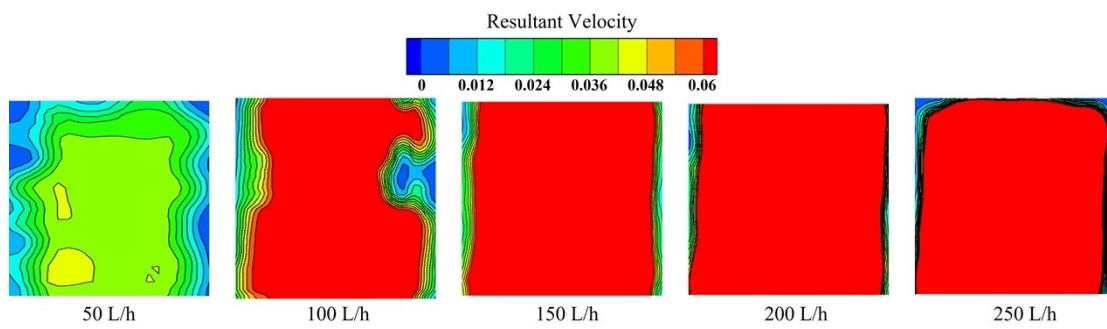


Fig. S8. PIV images at different flow rates at position E.